A COMPARATIVE STUDY ON THE EFFECTIVENESS OF MYOFASCIAL RELEASE AND DEEP FRICTION MASSAGE IN THE MANAGEMENT OF FOOT FUNCTION AND FLEXIBILITY AMONG CHRONIC PLANTAR FASCIITIS PATIENTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

(ELECTIVE – ADVANCED PT IN ORTHOPEDICS)

To

The Tamil Nadu Dr. M.G.R. Medical University

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CERTIFICATE

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INTERNAL EXAMINER:

EXTERNAL EXAMINER:

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DECLARATION

I hereby declare and present my project work entitled **"A COMPARATIVE STUDY ON THE EFFECTIVENESS OF MYOFASCIAL RELEASE AND DEEP FRICTION MASSAGE IN THE MANAGEMENT OF FOOT FUNCTION AND FLEXIBILITY AMONG CHRONIC PLANTAR FASCIITIS PATIENTS."**

The outcome of the original research work undertaken and carried out by me, under the guidance of Associate Professor **Mrs. J.Divya, M.P.T.,** RVS College of Physiotherapy, Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from The Tamil Nadu Dr. M.G.R Medical University.

Date: Signature

Place: (Rittu Susan Babu)

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CHAPTER I

INTRODUCTION

The plantar fasciitis is defined as the inflammation caused by excessive stretching of the plantar fascia. When the plantar fascia is excessively stretched, this can lead to heel pain, arch pain, and heel spurs. Plantar fasciitis isdescribedas apain on the plantar surface of the foot, arising from the insertion of the plantar fascia. Various terms have been used to describe plantar fasciitis, including jogger's heel, tennis heel, policeman's heel, and even gonorrheal heel.True plantar fasciitis is characterized by progressive pain with weight bearing as well as pain with the first few steps upon rising from a sitting position **(Placzek2008).**

There are three stages of plantar fasciitis:Stage-1,acute stage (0-4 weeks)withacute reversible inflammation. Minor achy pain after heavy activity or with first initial steps after period of inactivity. Symptoms are not constant and may resolve after basic anti-inflammatory measures followed by stretching exercise.Stage-2,subacute stage (4 week- 3months)withintense pain with activity and symptoms also at rest, but can still perform routine activities. Decreased inflammatory cells and increased angiofibroblastic invasion and develop calcaneal spur.Stage-3, chronic (3 months- 1 year)with intense pain with activity and at rest. Significant functional limitations because of pain and cannot perform routine activities, with partial or full rupture of plantar fascia and with extensive angiofibroblastic invasion**(Hyland 2006).**

Up to 10% of the population may present with heel pain over the course of their lives,83% of these patients being active working adults between the ages of 25 and 65 years old**.** Women are affected by plantar fasciitis twice as often as men. In young people, the condition occurs equally in both sexes.Prevalence rates of plantar

fasciitis among a population of runners have been shown to be between 4% and 22%. The overall incidence of plantar fasciitis in the military population was 10.55 per 1,000 person-years. The association of plantar fasciitis with increasing age is consistent with the histopathological findings of degeneration, rather than inflammatory changes within the plantar fascia. These degenerative findings support the hypothesis that plantar fasciitis is secondary to repetitive microtrauma caused by prolonged weight-bearing activities. The constant overload inhibits the normal repair process, resulting in collagen degeneration, which causes both structural changes and perifascialedema. These changes in turn lead to a thicker heel pad, increasing heel pad thickness leading to loss of heel pad elasticity; both of these factors are associated with increasing age and increasing BMI**(Scher 2010)**.

The plantar fascia is a thickened fibrous aponeurosis that originates from the medial tubercle of the calcaneus, runs forward to insert into the deepshort transverse ligaments of the metatarsal heads, dividing into 5 digital bands at the metatarsophalangeal jointsand continuing forward to form the fibrous flexor sheathes on the plantar aspect of the toes. Small plantar nerves are invested in and around the plantar fascia, acting to register and mediate pain. The plantar fascia is made up of 3 distinct parts: the medial, central, and lateral bands. The central plantar fascia is the thickest and strongest section, and this segment is also the most likely to be involved with plantar fasciitis. In normal circumstances, the plantar fascia acts like a windlass mechanism to provide tension and support through the arch. It functions as a tension bridge in the foot, providing both static support and dynamic shock absorption **(Young,2001).**

The exact cause of plantar fascia is not clear. The plantar fascia is designed to absorb the high stresses and strains placed on the feet. But, sometimes, too much

pressure damages or tears the tissues. The body's natural response to injury is inflammation, which results in the heel pain and stiffness of plantar fasciitis. The most common cause of plantar fasciitis is biomechanical dysfunction of the foot with overuse and other risk factors associated with plantar fasciitis such as obesity, tighter calf muscles that make it difficult to flex foot and bring toes up towards shin, faulty foot mechanics (flat foot, high arch foot, inward pointing knees) causes an abnormal walking pattern,repetitive impact activity (running/sports), improper shoes (worn, thin soled, lack arch support, or use of high heeled shoes), and other factors like age, family tendency, and disease such as arthritis and diabetes **(Dyck 2004).**

The major complaints of patients with plantar fasciitis are pain and stiffness in the bottom of heel. This develops gradually over time. It usually affects just one foot, but can affect both feet. Some patient describe the pain as dull, while others experience a sharp pain, and some feel a burning or ache on the bottom of foot extending outward from the heel. The pain is usually worse in the morning when patients take first steps out of bed or after been sitting or lying down for a while. Climbing stairs are also very difficult due to the heel stiffness. After prolonged activity, the pain can flare-up due to increased inflammation. Pain is not usually felt during the activity, but rather just after stopping**(Christine 2012)**.

On physical examination, patient may walk with their affected foot in an equine position to avoid placing pressure on the painful heel. Palpation of the medial plantar calcaneal region will elicit a sharp, stabbing pain. Passive ankle/first toe dorsiflexion can causediscomfort in the proximal plantar fascia, and can also assess tightness of the Achilles tendon. Mild redness or swelling will also be noted. Also evaluates the strength of muscles by checking muscle tone, reflexes, coordination, and balance.Special test: Windlass test, described as a forced dorsiflexion of the great toe

which is associated with an increase of pain at the insertion of the plantar fascia**(Garceau, 2003).**

In the clinical diagnosis of chronic heel pain, diagnostic imaging such as plan radiography mainly lateral view of the ankle can provide objective information for any stress fractures, unicameral bone cysts, and gaint cell tumors are usually identified; ultrasound examinationdone when the diagnosis is unclear, here plantar fascia thickness values have been used to measure; differential diagnosis includes, plantar fascia rupture, fad pad syndrome (atrophy of heel pad, common in elderly and diabetic patient), calcaneal bursitis (Policeman's heel), Boxter's nerve entrapment (no sensory disturbance and pain in the dorsal and proximal), medial calcaneal nerve compression (occur in tarsal tunnel), seronegativearthropathies, spinal stenosis and L5-S1 nerve root irritation **(Tahririan, 2012)**.

The conservativemanagement for chronic plantar fasciitis includes rest along with ice or hot packs; soft heel pad; night splint; nonsteroidal anti-inflammatory drugs; shock wave therapy; stretching exercises; and tapping **(Joshy 1999)**.

Therapeutic ultrasound is a high frequency sound wave which converts electrical energy into mechanical energy, which is accomplished by passing through a quartz crystal. The electric current cause crystal to expand and contract, this is called as piezoelectric effect. Ultrasound hashigh affinity for the tendons and ligaments (highly organized without high water content). It is a method of applying deep heat to the connectivetissue which decrease chronic plantar heel pain, inflammation, and aid healing by both thermal and mechanical effect on target tissue resulting an increasein local metabolism, circulation, increase in cell permeability, deform molecular

structures, alter diffusion and protein rate synthesis and extensibility of connective tissue and tissue regeneration(**Hooper1983**)

Myofascial release is a soft tissue manipulation technique, where ‘myo’ means muscle and fascia is located between skin and the underlying structure of muscle and bone throughout the body. The treatment purpose is to release restrictions within the deeper layers of fascia; here plantar fascia, grastrocnemius muscle and soleus muscle are released. The technique is a graded stretch of soft tissue by the therapist that is guided entirely by feedback from the recipient’s body to determine stretch direction, force, and duration to address specific soft tissue restrictions. Aims to relax contracted muscles, improve blood and lymphatic circulation,alleviation of pain, and stimulate the stretch reflex in muscles.Myofascial release technique has been proposed as an effective treatment procedure of chronic plantar fasciitis (**Eric 2007**).

Deep friction massageis a technique that concentrates on the deeper muscle tissues by applying deep finger pressure on the plantar fascia. A to and fro motion of deep pressure is provided which help to release the muscle tension, break scar tissue, and lead to its elimination. It concentrates on specific areas, leading to soreness before and after the massage, yet the results are definite and can be felt within just couple of days. Deep tissue massage loosens the muscles tissues, remove muscle toxins, and ensure proper circulation of blood and oxygen which had been affected by plantar fasciitis. Following the treatment, it is advisable to drink a lot of water to help remove the toxins from the body (**Estrada 2005**).

1.1 Need of the study

The reason of the study is to popularise the myofascial release technique and deep friction massage technique as a useful intervention method to improve foot function and flexibility among chronic plantar fasciitis patients.

1.2 Statement of study

A comparative study on the effectiveness of myofascialrelease and deep friction massagein the management offoot function and flexibility among chronic plantar fasciitis patients.

1.3 Objectives of the study

The objectives of the study are:

1. To find out the effectiveness of myofascial release technique on foot function and flexibilityamong chronic plantar fasciitis patients.
2. To find out the effectiveness of deep friction massage on foot function and flexibility among chronic plantar fasciitispatients.
3. To compare the effectiveness of myofascial release technique over deep friction massages technique on foot function and flexibility amongchronic plantar fasciitispatients.

1.4 Hypothesis

- It is hypothesized that there may be significant difference in foot function and flexibility following myofascial release technique among chronic plantar fasciitis patients.

- It is hypothesized that there may be significant difference in foot function and flexibility following deep friction massage technique among chronic plantar fasciitis patients.
- It is hypothesized there may not be significant difference between myofascial release technique anddeep friction massage technique in the management of foot function and flexibility among chronic plantar fasciitis patients.

1.5 Operational definitions

Plantar fasciitis

The plantar fasciitis is defined as the inflammation caused by excessive stretching of the plantar fascia. When the plantar fascia is excessively stretched, this can lead to heel pain, arch pain, and heel spurs **(Furey*et al.,* 1975).**

Myofascial release

Myofascial release is defined as the facilitation of mechanical, neural and physiological adaptive potential as interfaced by myofascial system. This is accomplished by a stretching of the muscular elastic components of the fascia, along with the crosslinks, and changing the viscosity of the ground substance of fascia **(Shah*et al.,* 2012).**

Deep friction massage

The deep friction massage is a defined as a mechanical stimulation of the superficial tissues over a small area by means of rhythmically applied deep pressure and stretching **(Kayser*et al.,*2005).**

Foot function

Foot function describes theposition of foot which moves every time when oneself take a step. The bones of the foot are arranged into 3 arches medial

longitudinal arch, lateral longitudinal arch, and transverse arch. These arches provide strength and stability for a proper foot function **(Michaud *et al.,*1993).**

Flexibility

Flexibility is defined as the ability to stretch a joint to the limit of its range of movement. Joint flexibility is defined as the range of motion allowed to a joint. A joint range of movement is measured by the double-armed Goniometer**(Medlej*et al.,*2014).**

CHAPTER II

REVIEW OF LITERATURE

Section A: Studies on effect of myofascial release technique on chronic plantar fasciitis.

Section B: Studies on effect of deep friction massage technique on chronic plantar fasciitis.

Section C: Studies on effect of stretching exercise on chronic plantar fasciitis.

Section D: Studies on effect of ultrasound on chronic plantar fasciitis.

Section E: Studies on the reliability and validity of foot functional index in measuring foot function.

Section F: Studies on the reliability and validity of goniometer in measuring flexibility of ankle.

Section A:Studies on effect ofmyofascial release technique on chronic plantar fasciitis.

Pattanshetty*et al.,*(2015)studied on immediate effect of three soft tissue manipulation techniques on pain response in chronic plantar fasciitis with randomized clinical trial. 60 participant with chronic plantar fasciitis were randomly allocated to group A (myofascial release), group B (positional release technique), and group C (passive stretching) along with therapeutic ultrasound on 1 W/cm^2 for 5 minutes. VAS scale for pain and ROM was outcome measures that were assessed for pre and immediately post interventional. Studies concluded that reduction in pain was more in group A individuals treated with myofascial release than compared to group B with positional release and group C with stretching exercises.

Neil*et al.,(*2014)studied on the use of manual therapy and exercise which found to be more effective than traditional physical therapy interventions in patients who suffered from plantar fasciitis. The patient who received myofascial release to plantar fascia as well as joint mobilization and manipulation to the foot show significant reduction in pain at 4 weeks and improvement in function at both 4 weeks and 6 months.Concluded the study as the myofascial release is more effective in plantar fasciitis.

Sivasankar*et al.,(*2014)studied on effect of ultrasound and myofascial release on pain and function in patients with plantar fasciitis. 20 patients were selected and divided into 2 groups as group A receive ultrasound and myofascial release, and group B receive plantar fascia and calf stretching exercises. The treatment was given on alternate days for a period of 2 weeks. Pain and function were used as outcome measures, both group showed significant reduction of pain and improvement of function. Concluded the study as ultrasound therapy and myofascial release is effective on pain and function in patients with plantar fasciitis.

Ordine *et al., (*2011)conducted a randomized control trial study to check out effectiveness of Myofascial release therapy for treating heel pain (plantar fasciitis). 4 treatment sessions given each week for total 4 weeks and result concluded that incorporation of myofascial release technique before static stretching is superior to isolated stretching for improving function and decreasing pain in patients with plantar fasciitis. The subjects treated with myofascial release showed an additional benefit in terms of reduction of pain on VAS and functional ability in terms of FFI. Hence it can be concluded that myofascial release is an effective therapeutic option in the treatment of plantar fasciitis.

Kuhar *et al., (*2007)performed a randomized control trial study to check out effectiveness of Myofascial release in treatment of Plantar Fasciitis using 30 subjects randomly allotting into two groups. Group A control group received therapeutic ultrasound, contrast bath, foot intrinsic muscles strengthening exercise, and plantar fascia stretching exercise and Group B experimental group received conventional treatment as group A added with added myofascial release technique for 15 minutes for 10 consecutive days and results concluded that the experimental group showed significantly higher improvement levels in term of both pain relief and in functional ability. So myofascial release is an effective therapeutic option in the treatment of plantar fasciitis.

Section B:Studieson effect of deep friction massage on chronic plantar fasciitis.

Formosa*et al., (*2014) has tested on the feasibility of a clinical trial comparing the effect of transverse friction massage and a home exercise programmeand home programme alone in the treatment of plantar fasciitis. 24 participants (14 females) aged 43-77 years with plantar fasciitis of greater than 4 weeks duration. 6 treatment session of friction massage in the first 4 weeks for experimental group together with a home programme for 6 weeks. The control group was given a home programme for 6 weeks. Main outcome measures VAS and lower extremity functional scale measured on assessment and every 2 week for 6 weeks. Subjects had reduction in pain at the end of 6-week treatment. Study concluded that the study demonstrated the feasibility of clinical trial for treatment of plantar fasciitis with friction massage and home exercise programme.Hence it was hypothesed that friction massage as an effective treatment for plantar fasciitis.

Higgins *et al.,*(2012)dida survey to determine how physical therapist treats plantar fasciitis. The survey asked for information regarding years of experience,

manual techniques, stretching activities and ultrasound application. The results of this survey were then compared to the suggestions found in the current literature. Clients during the survey were treated with ultrasound for 6-8 minutes, friction massage 5-10 minutes and stretching for 1 minute. Concluded the survey results as, the physical therapist use a variety of methods and modalities to treat plantar fasciitis. While the common goal is to provide the best treatment approach for clients diagnosed with plantar fasciitis.The result concluded that the friction massage therapy is more effective treatment for plantar fasciitis.

Ahamed*et al.,*(2011) studied the efficacy of low frequency stimulation in conjunction with specific plantar fascia friction massage, stretching exercise in treatment of plantar heel pain. 26 patients aged 18 to 60 years, complaining of plantar heel pain were assigned randomly to 2 treatment group. Control group received plantar fascia deep friction massage, stretching and strengthening exercises and experimental group received same treatment in addition to low frequency electrical stimulation. VAS and FFI were assessed before and after 4 weeks of treatment. It was concluded that plantar fascial friction massage, stretching and strengthening exercise have short-term pain relief and improvement in FFI activities in patients with plantar heel pain.

Keller*et al.,*(2008) studied on the effectiveness of massage therapy on chronic plantar fasciitis. This study consists of series of massage therapy including deep friction massage, palmar kneading, effleurage, and petrissage on chronic plantar fasciitis. Client subjective findings as well as VAS pain scale were used to track progress, the treatment plan was 30 minutes of massage therapy along with myofascial release and 5 minutes of hydro collator pack per week for 4 weeks. The study yielded superior results due to the fact that manual manipulation of the tissues

was performed longer each session and the study was longer in duration. These findings are clinically relevant and there are no complications of this study, so theses finding are appropriate to put into clinical practices.The result concluded that the friction massage therapy is more effective in plantar fasciitis.

Lowe *et al.*,(2003)hassuggested that massage technique are quite helpful in the treatment of plantar fasciitis. Working on the lower leg muscles, especially those involved in plantar flexion, is important because tightness in these muscles may contribute to excess tension in the fascia running from the leg through the bottom surface of the foot. Deep transverse friction can be used directly on the plantar fascia to stimulate fibroblast activity and tissue healing from chronic overuse. He also stated that longitudinal stripping methods applied to the bottom surface of the foot will help reduce tension in the intrinsic flexor muscles. Concluded the study as transverse friction massage is effective in relieving pain in plantar fasciitis.

Section C: Studies on effect of ultrasound on chronic plantar fasciitis.

Sivasankar *et al.*,(2014) did a study on effect of ultrasound and myofascial release on pain and function in patients with plantar fasciitis. 20 patients were selected and divided into 2 groups as group A receive ultrasound and myofascial release, and group B receive plantar fascia and calf stretching exercises. The treatment was given on alternate days for a period of 2 weeks. Pain and function were used as outcome measures. ‘t’ test was done. Both group showed significant reduction of pain and improvement of function. Concluded the study as the ultrasound therapy and myofascial release is effective on pain and function in patients with plantar fasciitis.

Razdan*et al.*,(2013) have conducted an ultrasound technique showing early promise as a quick and minimal invasive treatment for the common and painful foot

conditions. The finding is based on a short-term study involving just 65 patients, the researchers noted. The author tested the procedure ultrasound therapy that uses ultrasonic energy to cut and remove damaged, pain-generating tissue while sparing healthy foot tissue. A combination of high frequency/low amplitude sound waves are used to the damaged foot region. According to the study by 2 weeks after the treatment showed more improvement in their foot disability assessment.The result concluded the study that the ultrasound therapy is effective in alleviating pain in plantar fasciitis.

Graciele*et al.,*(2006) has studied the efficiency of continuous high power ultrasound for plantar fasciitis treatment. 22 individuals were assessed with pain lasting more than 6 months, through functional questionnaire and VAS for pain at the first morning load. Individual were divided into 2 groups first group stretching alone and second group stretching with 2 W/cm^2 ultrasound. After 15 treatment sessions, functional improvement was seen in both groups with no difference and the analysis of reduction in pain intensity was more in group 2 (54.6%) than group 1 (46.5%). Conclude the study as high power ultrasound is effective in reducing pain and improving function in plantar fasciitis patients.

Robert*et al.,*(2001)has performed a systematic review of randomized controlled trials in which ultrasound was used to treat people in condition like musculoskeletal injuries and soft tissue lesions. Each trial was assigned to investigate the contributions of active and placebo ultrasound to the patient's outcome measured. 35 randomized clinical trials were published, the results of 10 out of 35 trials were judged to acceptable methods using criteria based on those developed by Sackett et al. The result of 8 trial suggest that it is not and concluded there is little evidence that active therapeutic ultrasound is more effective than placebo ultrasound for treating

people with pain, a range of musculoskeletal injuries, or for promoting soft tissue healing. Theresults of 2 suggested that therapeutic ultrasound is more effective in treating clinical problems than placebo ultrasound.

Crawford*et al.,*(1995)evaluated the therapeutic effect from ultrasound in the treatment of plantar heel pain and to quantify the placebo effect of this electrophysical agent. 26 patients (14 bilateral) entered the study. Out of which 6 women and 7 men (3 bilateral episode in both sex) received true ultrasound here machine calibrated to deliver a dose of ultrasound at 0.5 W/cm^2, 3MHz, pulsed 1:4, for 8 minutes and 5 women and 8 men (3 women bilateral and 5 men bilateral episode) received placebo treatment with sham ultrasound here only the timer on the machine activated. The whole treatment was randomized for 8 days. The patients score was measured on VAS before and after the treatment, and analysed using a Wilcoxon Signed-Ranks test. Result showed both groups showed a reduction in pain, the improvement was 30% in treated group and 25% in placebo group. Concluded the study that therapeutic ultrasound is more effective than placebo in the treatment of plantar heel pain.

Section D: Studieson effect of stretching exercise on chronic plantar fasciitis.

Shivanna*et al.,*(2014) studied the effectiveness of stretching on pain in people with plantar fasciitis. 36 patients were diagnosed as having plantar fasciitis. They were advised to stretch the calf muscle for at least 5 minutes over a given wooden ridge. Their pain before and after calf stretching exercises was recorded on visual analogue scale and analysed. The average baseline score on VAS was 7.5 and all patients had significant reduction in pain score of average 4.2. The study concluded that the plantar fascia stretching are effective on plantar fasciitis in the short-term and improving the foot functional activityon long-term.

Almubarak*et al.*,(2012) aimed to review the evidence of exercise therapy in the treatment of plantar heel pain. Comprehensive search strategy was conducted to identify randomized and quasi-randomized trials. The primary outcome was pain intensity and secondary was functional limitation. From an initial list of 2327 potentially relevant trials, 7 trials were included such as exercise therapy sham versus control therapy; exercise therapy versus exercises therapy and calcaneal taping; exercise therapy versus exercise therapy and iontophoresis; exercise therapy versus other form of exercises therapy; exercise therapy versus exercises therapy with foot insole; exercise therapy versus exercises therapy with orthosis; and exercise therapy versus exercise therapy and low-energy shock wave therapy. Most trials included short-term follow up only of pain and function outcomes. The result revealed that combining stretching with other conservative treatments is more effective than stretching alone.

Sweeting *et al.*,(2011)studied on the effectiveness of stretching on pain and function in people with plantar fasciitis. 6 studies including 365 symptomatic participants were included. 2 compared stretching with a control, 1 study compared stretching to both alternative and control interventions, 1 study compared stretching to an alternative intervention, and 2 compared different stretching techniques and durations. Quality rating on the modified Pedro scale varied form 2-8 out of a maximum of 10 points. Most participants improved over the course of the studies, but when stretching was compared with alternative or control interventions, the changes only reached statistical significance. In one study that used a combination of calf muscle stretching and plantar fascia stretching in their stretching programme. Another study comparing different stretching techniques showed a statistically significant reduction in some aspects of pain in favour of plantar fascia stretching over calf

muscle stretches in the short term. The result of this systematic review demonstrated that patients with plantar heel pain who stretch tend to improve with regards to pain and function.

Giovanni *et al.,*(2006) studied tissue specific plantar fascia stretching exercises outcomes in patient with chronic plantar fasciitis. Suggested that effective durations of 30 seconds to 1 minute, at least 3 sets, up to 3 sessions per day show significant changes in range of motion have shown favourable results in treatment of plantar fasciitis with stretching exercises of the gastronemius, soleus, and plantar fascia.They concluded that a program of non-weight-bearing stretching exercise specific to the plantar fascia is superior to the standard program of weight-bearing Achilles tendon stretching exercise for the treatment of symptoms of proximal plantar fasciitis. The result concluded that the long-term benefits of the stretch include a marked decrease in pain.

Benedict *et al.,*(2003) done a prospective, randomized study done on tissue-specific plantar fascia-stretching exercise enhances outcomes in patient with chronic heel pain. In this study, evaluated 101 patients with chronic plantar fasciitis diagnosed for at least 10 months. The patients were grouped into 2. The first group was given a plantar fascia tissue-stretching program and the second group with Achilles tendon-stretching program. All patients were educated by a video on plantar fasciitis, were given specific insoles and an anti-inflammatory medication for 3 weeks. At 8 weeks, 82 patients had completed the therapy regimen and were reevaluated. The result concluded that patients with plantar fascia specific stretching showed statistically significant improvement compared with Achille tendon stretching program.

Section E: Studieson the reliability and validity of Foot Functional Index in measuring foot function.

Venditto*et al.,*(2013) had developed a brief outcome measure to assess foot and ankle conditions, the psychometric properties of a modified version of original FFI were examined. 86 subjects with musculoskeletal foot and ankle disorders were enrolled. The internal consistency and test-retest reliability were evaluated by using Cronabach's and intraclass correlation coefficient (ICC). Criterion validity was tested by Pearson's correlation coefficient between 17 items of Italian FFI and the lower extremity functional scale (LEFS). The responsiveness was calculated using the receiver operating characteristic curve (ROC). Concluded that FFI is a reliable and valid scale to evaluate the effectiveness of treatment in patients with musculoskeletal foot and ankle disorders.

Wu SH *et al.,* (2008) performed a study to evaluate the reliability and validity of foot function index among patients with plantar fasciitis and the results concluded the foot function index to be a very reliable and valid outcome measure to assess pain and disability among patients with plantar fasciitis

Garceau *et al.,* (2003) studied on the sensitivity and specificity of the Windlass test in diagnosing plantar fasciitis. 22 patients with plantar fasciitis and 23 patients with other type of foot pain and 30 patients in control group were evalutated with Windlass test in weight-bearing and non-weight-bearing position. There joint flexibility was measured by FFI. Result found was the patients with plantar fasciitis group had greater disability, as measured by FFI. Their average score of 3.34 compared to the other foot pain group. It was concluded that the foot function index to

be a very reliable and valid outcome measure for high specificity and low level of sensitivity Windlass test and it can be used in evaluating patients with plantar fasciitis.

Budiman *et al.,* (1991)studied on the foot function index which was developed to measure the impact of foot pathology on function in terms of pain, disability and activity limitation in patients. It is a self-administered index consisting of 23 items divided into 3 sub-scales, where both total and sub-scales scores are produced and was examined for test-retest reliability internal consistency, and construct and criterion validity. A total of 87 patients with rheumatoid arthritis were used in the study. Test-retest reliability of FI total and sub-scale scores ranged from 0.87 to 0.69, internal consistency ranged from 0.96 to 0.73 with the exception of factor analysis supported the construct validity of total index and sub-scale. Strong correlation between the FFI total and sub-scale scores and clinical measures of foot pathology supported the criterion validity of the index. It has been proved that FFI is a reasonable tool to use with low functioning individuals with foot disorders.

Section F: Studies on the reliability and validity of goniometer in measuring flexibility of ankle.

Weiss*et al.,*(2013) had done anintratester reliability on 52 adults for detecting real differences for quadriceps angle measurement based on standardised protocols and surface goniometry. They said that the surface goniometry protocol described appeared to be reliable for young women and men on measuring the range of motion.

Nussbaumer*et al.,(*2010) conducted a study to evaluate the construct validity of goniometers by measuring knee ROM in healthy controls the results showed that the goniometer provide greater value and good test retest value.

Sullivan *et al*., (2007) studied that the reliability and validity of goniometer in 45 subjects. It was concluded from the study that the ROM measurements taken with the universal goniometer of the extremity joints generally have good to excellent reliability. Reliability does not vary depending on the joint and motion being measured.

Riddle *et al*., (1987)purposeof the study was to examine the intratester and intertester reliabilities for clinical goniometric measurements of shoulder passive range of motion (PROM)using two different sizes of universal goniometers. Repeated PROM measurements of shoulder flexion, extension, abduction, shoulder horizontal abduction, horizontal adduction, lateral (external) rotation, and medial (internal) rotation were taken of two groups of 50 subjects each. The result of the study shows that Goniometric PROM measurements for the shoulder appear to be highly reliable when taken by the same physical therapist, regardless of the size of the goniometer used. The degree of intertester reliability for these measurements appears to be range-of motion specific.

CHAPTER III

METHODOLOGY

3.1 Study setting

This study was conducted at TSC Hospital, Trivandrum,Kerala.

3.2 Sample size

30 subjects wereselected who fulfilled the inclusion and exclusion criteria and were divided into 2groups.

1. Group A (n=15): Myofascial release technique along with stretching exercise and therapeutic ultrasound.
2. Group B (n=15): Deep friction massagealong with stretching exercise and therapeutic ultrasound.

3.3 Variables

3.3.1 Dependent Variables

1. Foot function
2. Flexibility

3.3.2 Independent Variables

1. Myofascial release technique along with stretching exercise and therapeutic ultrasound.
2. Deep friction massages technique along withstretching exercises and therapeutic ultrasound.

3.4 Measurement Tools

Variables	**Tools**
Foot function	Foot function index
Flexibility–foot dorsiflexion	Goniometer

3.5 Study designs

Pre-test and post-testexperimentaldesign.

3.6 Duration of study

The duration of study was one year.

3.7 Criteria for selection

3.7.1Inclusion criteria

1. Clinically diagnosed chronic plantar fasciitis patients.
2. Windlass test positive.
3. Age group between 40-65 years.
4. Females and Males included.
5. Patients who are willing to participate.
6. Patients who can understand and cooperate.

3.7.2 Exclusion Criteria

1. Subjects with clinical disorders such as infective conditions of foot, tumour, and calcaneal fracture.
2. Skin Disease.
3. Majortrauma or surgery in and around ankle joint and foot.
4. Impairedcirculation to lower extremities.
5. Referredpaindue to sciatica and other neurological disorders.
6. Foot deformities.
7. Obesity.

3.8 Orientation to the subjects

All the participants who were clinically diagnosed as chronic plantar fasciitis were screened after finding their suitability as per subjects who fulfil the inclusion and exclusion criteria and were briefed about the purpose of the study and the

intervention. The therapist had given a detail orientation to the various techniques such as myofascialrelease to group A and deep friction massage to group B with the test procedures such asfoot function indexandrange of motionto measure foot function andflexibility. The consent and full cooperation of each participant was sought after complete explanation of the condition and demonstration of the procedures involved in the study.

3.9Test administration

Foot function

Purpose: To assess the foot function index (FFI). The patient is asked to indicate how the foot pain has affected his/her ability to manage in everyday life.

Equipment required: Foot function index, a numeric scales to assess foot function.

Procedure: There are about 23 questions divided into 3 sections. Each patienthas to score their pain, disability, and limitation of activity based on the questionnaire provided. Accordingto a scale, score range from 0 to 10 for all 23 questions. Zero indicates no pain, no difficulty and none of the time. Ten indicates worst pain imaginable, so difficult unable to do and all the time.

Flexibility

Purpose: To assess the flexibility of foot by measuring the dorsiflexion of ankle joint to know the present level of range of motion.

Equipment required: Goniometer.

Procedure: Dorsiflexion of ankle is measured with the patient sitting with knee flexed to 90 degree and by keeping the fulcrum of goniometer over the lateral malleolus of the affected foot with the stationary arm parallel to the fibula and moveable arm parallel to the fifth metatarsal and then measure the dorsiflexion.

3.10Treatment procedure

Myofascial release technique

Table-1: Shows different myofascial release technique

Slno	Muscle	Method	Figure
1	Grastrocnemius	With the patient prone lying and the therapist standing at the foot end of table facing towards head of the patient. Therapist places elbow to the bulky muscle gastrocnemius to release the tightness and also use fingers to release fascia of gastrocnemius tendon with the therapist facing towards the feet while standing at the patients side around mid-thigh level, repeated for 3-5 times.	 
2	Soleus	With the patient prone lying and a bolster placed at the feet to induce 10-15 degrees of knee flexion and the therapist facing towards the head while standing at the foot end of the table, using elbow pressure applied to release the tightness, repeated for 3-5 times.	

3	Plantar fascia	With the patient prone lying and the therapist place fistover the sole. Then move in to and fro direction, while maintaining a steady pressure. Treatment continues until therapist feel tissues relax, for 3-5 times.	

Treatment duration: One session per day alternately for 5 weeks.

Deep friction massage technique

Position of patient: Half lying

Therapist position: Standing.

Area of application: Plantar fascia.

Duration: 10 minutes

Method of application:The patient were positioned comfortably and deep friction massage was applied directly to the origin of plantar fascia using a repetitive back and forth motion, across the affected structure with adequate sweep to cover the affected area and sufficient depth to produce mechanical stretching of the underlying structure, with great toe in dorsiflexion throughout the procedure in order to maintain a stretch to the plantar fascia.

Treatment duration: One session per day alternately for 5 weeks.

Figure-1: Shows deep friction massage.

Ultrasound therapy

Position of patient: Prone with foot placed outside the treatment table.

Therapist position: Standing**.**

Area of application: Around the plantar aspect of the foot.

Parameters

Frequency: 1 MHz, continuous mode.

Intensity: 1 watts/cm^2

Duration: 8 minutes.

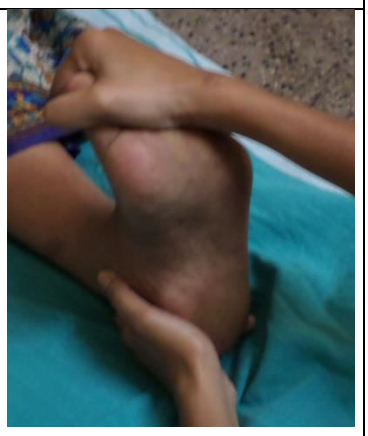
Method of application: The patient were positioned comfortably, and the part was cleaned and ultrasonic gel was applied to the involved site and then the transducer headstock moved in a slow, continuous, and in circular pattern over foot in order to obtain ultrasound waves concentration, thus achieving a focal application without producing undesirable effects on adjacent tissues.

Treatment duration: One session one day for alternate days for 5 weeks.

Figure-2 Shows ultrasound therapy.

Stretching exercises

Table-2: Shows different stretching exercises

Slno	Muscle	Method	Figure
1	Grastrocnemius	With the patient supine and knee extended, pressure was placed over bottom of the foot while the ankle was held in dorsi-flexion.Stretch held for 30 seconds and repeated for 3-5 times.	
2	Soleus	With the patient prone and knee flexed to 90 degree and passively dorsiflexes the foot.The stretch is held for 30 seconds and repeated for 3-5 times.	
3	Plantar fascia	With the patient supine and by supporting the ankle, thetherapist places fingers on patient's (toes) metatarsophalangeal jointand extends till the patient feels the stretch on the plantar fascia.The stretch is held for 30 seconds and repeated for 3-5 times.	

Treatment duration: One session per day for alternate days for 5 weeks.

Home advices for both groups:

1. Wear shoes with adequate arch support and cushioned heels.
2. Avoid prolong standing.
3. Avoid exercise and walking barefoot on hard surfaces.
4. Advised home programme with stretching and strengthening exercises.

CHAPTER IV

DATA ANALYSIS AND RESULTS

4.1 Data analysis

The chapter deals with systematic presentation of the analysed data followed by the interpretation of the data.

Paired't' test was used as a parametric test to find the intra group significance.

Unpaired't' test was used as a parametric test to find the inter group significance.

a) Paired't' tests

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \frac{\sqrt{\sum d^2 - \frac{\sum (d)^2}{n}}}{n - 1}$$

Where,

d – Difference between pre-test and post test values

$\bar{d} = \frac{\sum d}{n}$ – Mean of difference between pre test and post test values

n – Total number of subjects

s – Standard deviation

b) Un paired t' test

$$s = \sqrt{\frac{\sum(x_1 - \bar{x}_2)^2 + \sum(x_2 - \bar{x}_2)^2}{n_1 + n_2 - 2}}$$

$$T = \frac{\bar{x}_1 - \bar{x}_2}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

S = Standard deviation

n_1 = Number of subjects in Group A

n_2= Number of subjects in Group B

$\bar{x}_1$ = Mean of the difference in values between pre-test and post-test in Group-A

$\bar{x}_2$= Mean of the difference in values between pre-test and post-test in Group-B

Table-3

The table shows mean value, mean difference, standard deviation, and paired‘t’ value between pre- test and post-test scores of foot function among group A.

Measurement	**Mean**	**Mean difference**	**Standard deviation**	**Paired ‘t’ value**
Pre- test	86.47	72.54	5.47	51.1*
Post- test	13.93			

*< 0.005 level of significance

In group A calculated paired‘t’ value offoot function indexis 51.1 and the‘t’ table value is 2.977 at 0.005 level of significance. Since the calculated‘t’ value is more than the‘t’ table value, it shows that there is significant difference infoot functionfollowing myofascial release technique among chronic plantar fasciitis patients.

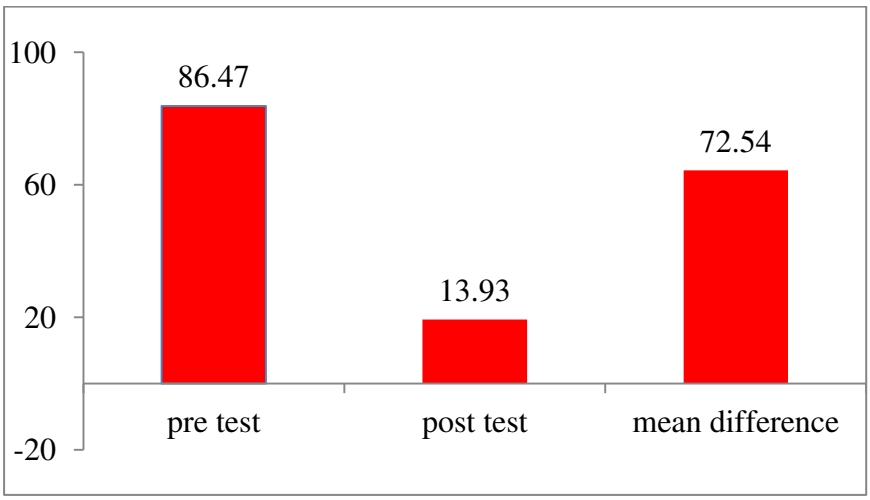


Figure 3: Shows the graphical representation of pre and post-test values of foot functionin Group A.

Table-4

The table shows mean value, mean difference, standard deviation, and paired‘t’ value between pre- test and post-test scores of foot function among group B.

Measurement	**Mean**	**Mean difference**	**Standard deviation**	**Paired ‘t’ value**
Pre- test	83.79	64.41	3.58	70.3*
Post- test	19.38			

*< 0.005 level of significance

In group A calculated paired‘t’ value offoot function indexis 70.3 and the‘t’ table value is 2.977 at 0.005 level of significance. Since the calculated‘t’ value is more than the‘t’ table value, it shows that there is significant difference infoot functionfollowing deep friction massage technique among chronic plantar fasciitis patients.

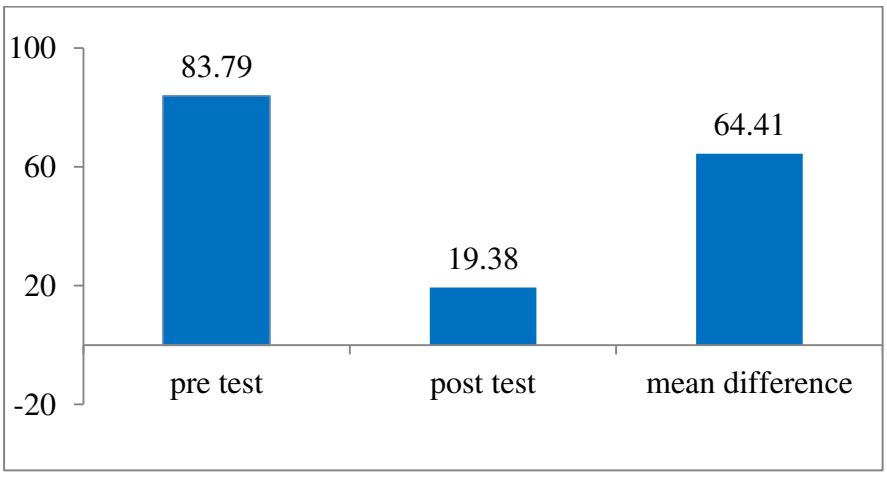


Figure 4: Shows the graphical representation of pre and post-test values of footfunctionin Group B.

Table-5

The table shows mean value, mean difference, standard deviation, and unpaired‘t’ value of foot function between Group A and Group B.

SI.no	Groups	Improvement		Standard deviation	Un paired ‘t’ Test
		Mean	**MeanDifference**		
1	GROUP-A	72.2	7.2	1.91	16.614*
2	GROUP-B	65			

*<0.005 level of significance

In group A and group B,calculated unpaired‘t’ value of foot function index is 16.614and the‘t’table value is 2.763 at 0.005 level. Since the calculated‘t’ value is more than the‘t’table value, means there is significant difference between myofascial release and deep friction massage in improving foot function among chronic plantar fasciitis patients.

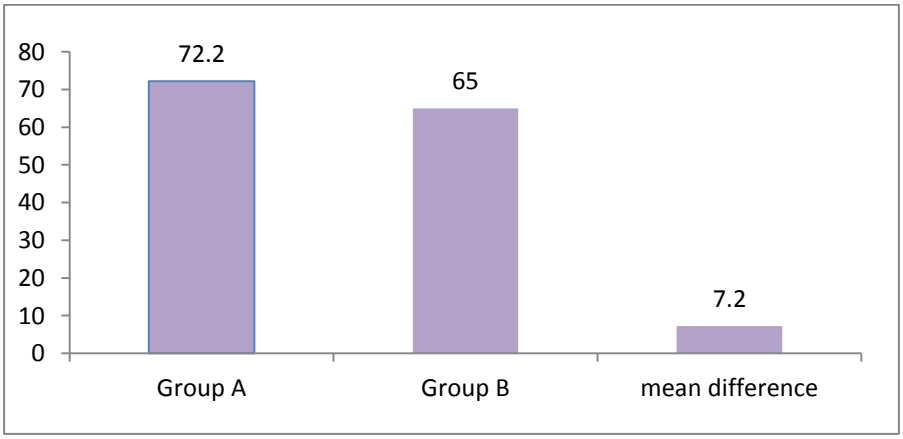


Figure 5: Shows the graphical representation of pre and post-test values of foot function in Group A and B.

Table-6

The table shows mean value, mean difference, standard deviation, and paired‘t’ value between pre- test and post-test scores of flexibility among group A.

Measurement	**Mean**	**Mean difference**	**Standard deviation**	**Paired ‘t’ value**
Pre- test	7.73	9.47	2.030	18.12*
Post- test	17.2			

*<0.005 level of significance

In group A, calculated paired‘t’ value of flexibility is 18.12andthe‘t’ table value is 2.977 at 0.005 level. Since the calculated‘t’ value is more thanthe‘t’ table value, it shows that there is significant difference inankle dorsiflexion following myofascial release technique among chronic plantar fasciitis patients.

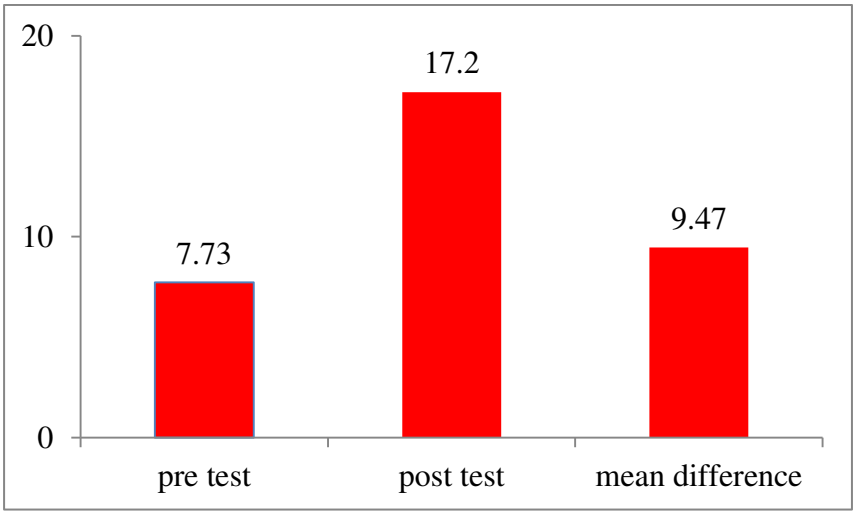


Figure 6: Shows the graphical representation of pre and post-test values of flexibility in Group A.

Table-7

The table shows mean value, mean difference, standard deviation, and paired‘t’ value between pre- test and post-test scores of flexibility among group B.

Measurement	Mean	Mean difference	Standard deviation	Paired ‘t’ value
Pre- test Post- test	7.66 15.6	7.84	1.709	17.89*

*< 0.005 level of significance

In group B, calculated paired‘t’ value of flexibility is 17.89 and the‘t’ table value is 2.977 at 0.005 level. Since the calculated‘t’ value is more than the ‘t’ table value, it shows that there is significant difference inankle dorsiflexionfollowing deep friction massage technique among chronic plantar fasciitis patients.

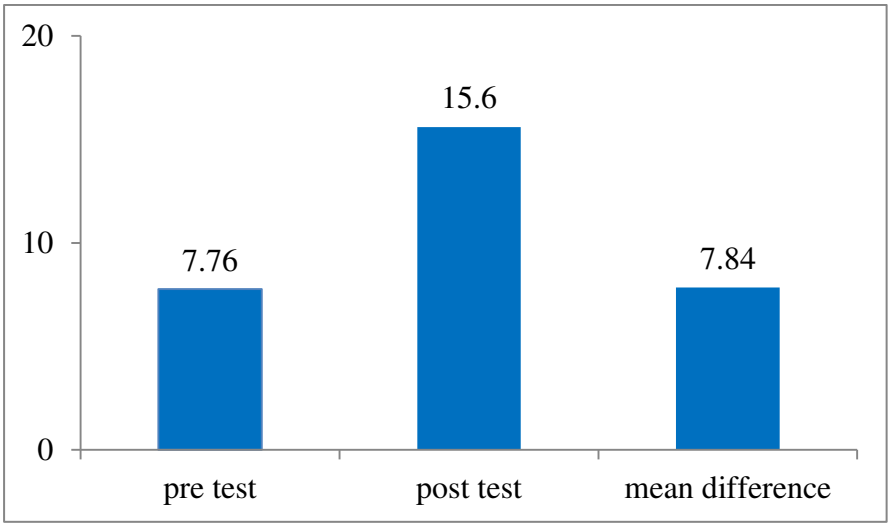


Figure 7: Shows the graphical representation of pre and post-test values of flexibility in Group B.

Table-8

The table shows mean value, mean difference, standard deviation, and unpaired‘t’ value of flexibility between Group A and Group B.

SI.no	Groups	Improvement		Standard deviation	Un paired ‘t’ Test
		Mean	**MeanDifference**		
1	GROUP-A	9.5	1.6	1.233	2.92*
2	GROUP-B	7.9			

*<0.005 level of significance

In group A and group B calculated un paired‘t’ value for flexibility is 2.92andthe‘t’ table value is 2.763 at 0.005 level. Since the calculated‘t’ value is more than the‘t’ table value, it shows that there is significant difference between myofascial release and deep friction massage in improving ankle dorsiflexionamong chronic plantar fasciitis patients.

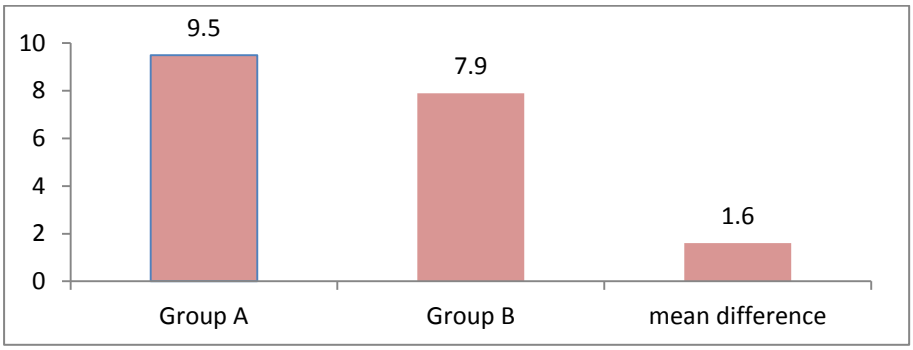


Figure 8: Shows the graphical representation of pre and post-test values of flexibilityin Group A and B.

4.2 Results

30 plantar fasciitis subjects were selected for the study. The subjects were randomly divided into 2 equal groups, group A and group B. For group A, myofascialrelease technique was given and for group B, deep friction massage technique was given along with ultrasound and stretching exercises.

The patients were treated one session per day alternatively for 5 weeks. Before starting the treatment, the foot function was graded by foot function index and the flexibility of ankle dorsiflexion was graded by goniometer. The measurement was repeated at the end of the study.

Analysis of dependent variable foot function in Group A: The calculated paired 't' value of foot function index is51.1 and the 't' table value is 2.977 at 0.005 level of significance. Hence, the calculated 't' value is greater than the 't' value and there is significant difference in foot function following myofascial release technique among chronic plantar fasciitis patients.

Analysis of dependent variable foot function in Group B: The calculated paired 't' valueof foot function index is 70.3and the table 't' value is 2.977 at 0.005 level of significance. Hence, the calculated 't' value is greater than the 't' value there is significant difference in foot function following deep friction massage technique among chronic plantar fasciitis patients.

Comparing the dependent variable foot function between Group A and Group B: The calculated unpaired't' value of foot function index is 16.614 and the 't' table value is 2.763 at 0.005 level of significance. Hence the calculated't' value is greater thantable 't' value there in significant difference betweenmyofascial release and deep friction massage technique in improving foot function among chronic plantar fasciitis patients.

When comparing the mean values of group A and B, group A subjects treated with myofascial release showed more difference than group B. Hence it is concluded that myofascial release is more effective than deep friction massage in improving the foot function among chronic plantar fasciitis patients

Analysis of dependent variable flexibility in group A: The calculated paired‘t’ value of flexibility is 18.12and the table‘t’ value is 2.977 at 0.005 level of significance. Hence the calculated‘t’ value is greater than the table‘t’ value is significant difference in ankle dorsiflexion following myofascial release.

Analysis of dependent variable flexibility in group B: The calculated paired‘t’ valueof flexibility is 17.89and the table‘t’ value is 2.977 at 0.005 level of significance. Hence the calculated‘t’ value is greater than the table‘t’ value is significant difference in ankle dorsiflexion following deep friction massage.

Comparing the dependent variable flexibility between Group A and Group B: The calculated unpaired‘t’ valueof flexibility is 2.92 and the‘t’ table value is 2.763 at 0.005 level of significance. Hence the calculated‘t’ value is greater than table‘t’ value there in significant difference betweenmyofascial release and deep friction massage technique in improvingankle dorsiflexion among chronic plantar fasciitis patients.

When comparing the mean values of group A and B, group A subjects treated with myofascial release showed more difference than group B. Hence it is concluded that myofascial release is more effective than deep friction massage in improving the flexibility of ankle dorsiflexion among chronic plantar fasciitis patients.

CHAPTER V

DISCUSSION

Plantar fasciitis is a common cause of hind foot pain. Plantar fasciitis is thought to be caused by non-inflammatory degenerative changes in theplantar fascia. Plantar fascia is a thick band of connective tissue that runs along the bottom of the foot from the heel to the base of each of the five toes. It is thinner and weaker at the heel and gets thicker and stronger as it fans out towards toes. Because of this structure it is more susceptible to micro trauma, tearing and inflammation of the heel called plantar fasciitis.

A clinical trial was conducted to compare the effectiveness of myofascial release and deep friction massage along with passive stretching and therapeutic ultrasound on foot function and flexibility on individual with chronic plantar fasciitis. The statistical data shows there is an increase in foot function and flexibility of ankle dorsiflexion at the end of 5‾weeks of treatment period.

Therapeutic ultrasound deliverscontinuous energy wave which produce thermal and nonthermal(mechanical) effects. The physiological effect of thermal include increased tissue temperature, increased local blood flow, increased extensibility of tissue and reduced viscosity of fluid elements in the tissue. This mechanical effect accelerate tissue metabolism by promoting cellular permeability and ion transport across cellular membrane. Ultrasound affect the sensitivity of sensory receptors such as muscle spindle and high threshold mechanoreceptors in skeletal muscle and that this led to the increased range of motion. Therefore therapeutic ultrasound used for relief of pain and muscle spasm and for improvement of joint contracture and wounded tissues**(Katsuyuki 2014).**

Therapeutic ultrasound has shown to relieve pain in plantar fasciitis. Dosage of ultrasound in this study was based on the evidence suggested by Hronkova*et al.,* 2000 which reduced pain in 50% of patients. So continuous ultrasound was preferred for soft tissue repair and for the study 1 MHz frequency with an output of 1 W/cm^2 was chosen, as it is capable of reaching to deeper tissues.

The goal of myofascial release is to release fascia restriction and restore its tissue. This technique is used to ease pressure in the fibrous bands of the connective tissue function, or fascia. Gentle and sustained stretching of myofascial release is believed to free adhesions and softens and lengthens the fascia. By freeing up fascia,myofascialrelease helps in improving circulation and nervous system transmission and normalizes the connective tissue by softening, lengthening, and realign the fascia**(Renan-Ordine 2011).**

Result of the present study shows that there is significant difference in foot function and flexibility of ankle dorsiflexion by myofascial release.It is supported by Kuhar*et al.,*2007, who performed a randomized control trial study to check out effectiveness of Myofascial release in treatment of Plantar Fasciitis, using 30 subjects randomly allotting into two groups for 10 consecutive days and results concluded that the experimental group with myofascial release showed significantly higher improvement levels in term of both pain relief and in functional ability.

Frictionmassage involves the application of friction and pressure at depth to the lesion which is considered to be the cause of pain or reduced function.Force is applied perpendicular to the fibres in an attempt to separate each fibres, mechanically, promotes local hyperemia, analgesia, and reduction of adherent scar tissue to ligament, tendon and muscle structure. The result of friction massage is to resets of sarcomere lengthening which improves the soft tissue healing but also realign the

muscle fibres by offering the effective stretching and mobilization to the taut bands **(Dean, 2003).**

Result of the present study shows that there is significant difference in foot function and flexibility of ankle dorsiflexion bydeep friction massage. It is supported by Formosa *et al.,*2014 whohas tested on the feasibility of a clinical trial comparing the effect of transverse friction massage and home exercise programme in the treatment of plantar fasciitis with 24 participants aged 43-77 years with plantar fasciitis of greater than 4 weeks duration. Subjects had reduction in pain at the end of 6-week treatmentwith friction massage.

The present study is concluded on the basis of the improvement in the foot function and flexibility among chronic plantar fasciitis patients, when comparing both the techniques group Apatients treated with myofascial release technique shows more improvement in foot functionandflexibility than group B patients treated with deep friction massage technique.

Hence, first and second hypothesis are accepted and reject the third hypothesis.

CHAPTER VI

CONCLUSION

A comparative study was conducted to evaluate the effectiveness of myofascial release technique and deep friction massage technique on foot function and flexibility among chronic plantar fasciitis patients.

30 patients with chronic plantar fasciitis were included in the study and divided into two groups, group A and B, each group consist of 15 patients.

Group A was treated with myofascial release and Group B was treated with deep friction massage along with therapeutic ultrasound and passive stretching exercise. Foot function of ankle was assessed before and after intervention by foot function index and flexibility was assessed before and after intervention by goniometer.

The present study statistically demonstrates that both the technique is effective in improving the foot function and flexibility in subjects with chronic plantar fasciitis. But when comparing the mean values it was found that there was mean significant improvement in patients treated with myofascial release technique than deep friction massage techniques.

6.1 Limitations

- Occupation.
- Home exercises.
- The study did not include follow up.

6.2 Suggestions

- The study can be compared with other treatment variables.
- The study can be conducted for other age groups.

CHAPTER VII

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ANNEXURES

ANNEXURE-I

PHYSIOTHERAPY ASSESSMENT

1) **Subjective Examination**

   a) Name :

   b) Age : Date of birth :

   c) Sex : M ☐ F ☐

   d) Occupation :

   e) Weight :

   f) Chief complaints :

   g) Duration :

2) **History collection**

   a) Present Medical history

   b) Past Medical history

   c) Social history

   d) Family history

   e) Associated problems

3) **Pain assessment (VAS)**

   a) Onset

   b) Duration

   c) Site/Side

   d) Type

   e) Nature

   f) Aggravating factor

   g) Relieving factor

4) Objective Assessment

a) On observation

- General body built
- Posture
- Gait
- Attitude of limb
- Deformity
- Redness
- Skin changes
- External appliances

b) On palpation

- Warmth
- Swelling
- Local tenderness
- Oedema
- Muscle spasm

c) On examination

- **Vital signs**
- **Motor examination**
    - Muscle muscle testing
    - Range of motion assessment

Movement	**AROM**	**PROM**
Dorsiflexion		
Plantarflexion		

- **Sensory examination**
    - Superficial Sensations
    - Deep Sensations

5) **Special test**
    - Windlass test
6) **Investigation**
    - **X-ray**
7) **Diagnosis**

ANNEXURE-II

Special test:Windlass test

Patient position: Sitting with 90 degree knee flexion on treatment table.

Therapist position: Sitting.

Procedure: The examiner stabilizes the ankle in neutral position with one hand and grasps the proximal segment of the hallux with the other hand. The interphalangeal joints were allowed to flex so that the flexor halluces longus muscle would not restrict motion. Thegreat toe was passivelydorsiflexed to end range or until the subject felt pain.

Implication:A positive Windlass test was defined as that reproducing the subjects specific pain.

ANNEXURE-III

Foot Function Index

Patient Name: _____ Date:_____

M / F: _____ Age: _____ Hospital No: _____

This questionnaire has been designed to give your therapist information as to how your foot pain has affected your ability to manage in everyday life. Please answer every question. For each of the following questions, we would like you to score each question on a scale from 0 (no pain or difficulty) to 10 (worst pain imaginable or so difficult it required help) that best describes your foot over the past week. Please read each question and place a number from 0-10 in the corresponding box.

No Pain 1 23 4 5 6 7 8 9 10Worst Pain Imaginable

Pain subscale: How severe is your foot pain.

Foot pain at its worst?		Foot pain in morning?	
Pain walking barefoot?		Pain standing barefoot?	
Pain walking with shoes?		Pain standing with shoes?	
Pain walking with orthotics?		Pain standing with orthotics?	
Foot pain at end of day?			

Disability Subscale: How much difficulty did you have

Difficulty walking in house?		Difficulty walking outside?	
Difficulty walking 4 blocks?		Difficulty climbing stairs?	
Difficulty descending stairs?		Difficulty standing tip toe?	
Difficulty getting up from chair?		Difficulty climbing curbs?	
Difficulty walking fast?			

Activity Limitation Subscale: How much of the time do you

Stay inside all day because of feet?		Stay in bed because of feet?	
Limit activities because of feet?		Use assistive device indoors?	
Use assistive device outdoors?			

Office use only

Total score :

____ / 230 points.

PT incharge:

Group

Patient no:

Score: ___/230 x 100 = ___%

High scores indicate greater disability/decreased function.

ANNEXURE-IV

Table-9: Preandpost-testvaluesof range of motion of ankle dorsiflexion inGroupA and B.

Sl.No	GROUP A		GROUP B	
	PRETEST	POSTTEST	PRETEST	POSTTEST
1	15	19	15	20
2	10	18	10	18
3	10	20	12	20
4	8	16	8	18
5	9	19	6	15
6	5	12	5	17
7	6	13	7	18
8	7	14	7	15
9	5	12	9	18
10	8	15	8	19
11	6	14	7	16
12	5	14	6	15
13	7	16	5	14
14	8	15	5	18
15	6	17	6	18

ANNEXURE-V

Table10: Preandpost-testvalues of foot function index inGroup A and B.

Sl.No	GROUP A		GROUP B	
	Pretest in %	**Post test in %**	**Pretest in %**	**Post test in %**
1	76.52	6.95	73.91	9.56
2	78.26	9.56	78.26	11.73
3	87.39	8.69	82.17	19.56
4	86.95	13.39	85.21	21.3
5	81.3	15.21	91.3	19.56
6	85.65	13.04	80.86	12.6
7	80.43	8.69	95.21	30.43
8	92.6	21.73	82.6	20.86
9	78.69	8.26	80.86	19.56
10	85.21	17.39	84.34	21.3
11	82.17	12.17	93.91	36.95
12	96	26.95	85.65	23.91
13	83.91	12.6	81.3	15.65
14	97.82	25.21	78.69	14.78
15	84.78	8.69	82.6	13.04

ANNEXURE-VI

PATIENTCONSENTFORM

I …….Voluntarily consent to participate in the research named on "**A COMPARITIVE STUDY ON THE EFFECTIVENESS OF MYOFASCIAL RELEASE AND DEEP FRICTION MASSAGE IN THE MANGEMENT OFFOOT FUNCTION AND FLEXIBLITY AMONG CHRONIC PLANTAR FASICIITIS PATIENTS".**

The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient **Signature of researcher**

Name and signature of witness

Place:

Date: